U.S. Nuclear Reactors

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Nuclear Reactor (defined): A device in which a nuclear fission chain reaction occurs under controlled conditions so that the heat yield can be harnessed or the neutron beams utilized.

Introduction: As of December 31, 2007, there are 104 commercial nuclear generating units that are fully licensed by the U.S. Nuclear Regulatory Commission (NRC) to operate in the United States. Of these 104 reactors, 69 are categorized a pressurized water reactors (PWRs) totaling 65,100 net megawatts (electric) and 35 units are boiling water reactors (BWR) totaling 32,300 net megawatts (electric).

The current Administration has been supportive of nuclear expansion, emphasizing its importance in maintaining a diverse energy supply. But as of December 31, 2007, the last new reactor to come on line in the United States was the Tennessee Valley Authority's Watts Bar 1 reactor in Tennessee. Nuclear expansion has been through the uprating (increasing in capacity) of existing power plants. In addition, the Browns Ferry 1 reactor (included in the total of 104) was rebuilt, uprated, and returned to service in June 2007, after being shut down for decades.

On July 13, 2007, UniStar Nuclear, LLC, filed a combined license application (COL) with the NRC for construction of a new reactor at the Calvert Cliffs Nuclear Station. It was the first COL application filed. TVA announced plans to complete construction of the Watts Bar 2 reactor. Watts Bar 2 received a construction permit in 1973. If the unit goes on line, it will be the last reactor to receive a construction permit and license separately. As of March 31, 2008, the NRC has received 9 COL applications and is currently reviewing them.

Current Status of the U.S. Nuclear Industry

Reactor Data Tables

Alphabetical Listing: This is a site-by-site summary of the 65 locations that provides operational data for each of the 104 U.S.

Outlook for the U.S. Nuclear Industry:

Potential New Commercial Reactors: This analytical feature identifies the location, sponsoring firm, proposed reactor design and potential capacity, and application status (either Early Site Permit or Combined Operator License) of 24 proposed new commercial reactors. Each of the projects is discussed in the text.

New Reactor Designs: This feature article focuses mainly on the new Generation IV reactors, but also discusses other designs that could have an impact on the future of the U.S. and international nuclear market.

Historical Trends of the U.S. Nuclear Industry:

Operable Nuclear Generating Units

- The number of US commercial reactors in service since 1973 (monthly and annually) is reported in Table 8.1 of the Monthly Energy Review. There are 104 commercial nuclear generating units licensed to operate in the United States. In addition, there were three construction permits that are still valid for reactors on which construction has halted.
- Shutdown Reactor List: This listing includes the U.S. nuclear generating units that have been permanently shutdown.
- Unique Reactors (updated) highlights interesting facts about some of the best known and most unusual nuclear generating units. It includes information on the first reactors, the oldest ones in service, and the largest reactors.

Useful Information on Other Websites:

Daily Status Report: The U.S. Nuclear Regulatory Commission (NRC) maintains a list of all licensed U.S. commercial nuclear reactors and calculates the percentage of output per unit per day. One recent change to the report's format makes it possible to review the historical daily status of each unit.

reactors.

Reactor Status List: This listing includes the builder, capacity, type, critical dates, and operator of each U.S. commercial reactor.

State Listing: The alphabetical listing focuses on individual reactors, but the State listing examines the impact of the nuclear industry on each of the 31 States that have commercial nuclear power plants. Data provided include excerpts from media, Nitrogen Oxide and sulfuric dioxide emissions levels, licensing status, capacity, generation, and links to local websites.

Nuclear Generating Units and Capacity, 1994 through 2007

Year	Units	Capacity Million Kilowatts	New Units / On- Line Date	Retiring Units / Date Announced
1994	109	99.148	N/A	N/A
1995	109	99.515	N/A	N/A
1996	109	100.784	Watts Bar 1 May 1996	Zion 2 Sept 1996
1997	107	99.716	N/A	Haddam Neck Dec 1996 Zion 1 Feb 1994 Big Rock Point Aug 1997
1998	104	97.07	N/A	Millstone 1 July 1998
1999	104	97.411	N/A	N/A
2000	104	97.86	N/A	N/A
2001	104	98.159	N/A	N/A
2002	104	98.657	N/A	N/A
2003	104	99.209	N/A	N/A
2004	104	99.628	N/A	N/A
2005	104	99.988	N/A	N/A
2006	104	100.334	N/A	N/A
2007	104	P100.334	N/A	N/A

P = Preliminary
N/A = Not Applicable
Source: Energy Information Administration, Monthly Energy Review, table 8.1, various issues.

Diagrams of Reactors: The Berkeley web site contains diagrams and photos of various reactors, including the following:
Advanced Boiling Water Reactor (ABWR)
Advanced Liquid Metal Reactor: (ALMR)
Integral Fast Reactor (IFR)
Modular High Temperature Gas Cooled Reactor (MHTGR)

Nuclear Safety and Security : Nuclear Safety received attention long before the terrorist attacks on September 11th heightened public interest. The U.S. Nuclear Regulatory Commission (NRC) conducts oversight of the nuclear industry. All of the licensed U. S. commercial reactors are required to have a containment dome to protect the reactor from external damage and to prevent the release of radiation. The structure protecting a reactor includes massive amounts of concrete reinforced by steel. But nuclear power plants owners do not rely on concrete and steel alone. The Nuclear Energy Institute (NEI) worked with several nuclear power plants to produce a Nuclear Plant Security Video to inform the public about how plants are protected. A free viewer is provided by NEI to observe the film. Nuclear Safety received attention long before the terrorist attacks on September 11th heightened public interest.

Outages: (Performance Indicators in 2002) A series of bar charts prepared by the Nuclear Energy Institute (NEI) illustrate unit capability, unplanned capability loss and automatic scrams, safety system performance, fuel performance, chemistry performance, and industrial safety. Two charts at the end of the feature compare collective radiation at PWR plants and BWR plants.

Uprates of Nuclear Capacity With projected increases in electricity demand, construction of new nuclear power plants or the re-activation of shutdown reactors is drawing public and media attention. Both of these options, however, would take place in the future- if at all. A third option that is already taking place has generated less publicity: uprating existing units to generate more power. Although the uprates are usually less than 10 percent, they are quite significant. If all of the proposals are implemented, nuclear capacity would increase by more than the construction of any new reactor design now under consideration.

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